Amendments to Claims

1. (Original) An apparatus for forming a relief pattern from a photosensitive element comprising a flexible substrate having an exterior surface and an interior surface, and a composition layer on the substrate capable of being partially liquefied, the composition layer having an exterior surface and an interior surface, with the composition layer and flexible substrate joined at their respective interior surfaces, comprising:

a roller mounted for rotation in a first frame portion for supplying an absorbent material to the exterior surface of the composition layer;

a drum mounted for rotation in a second frame portion with means for supporting the photosensitive element on an outer circumferential surface of the drum with the exterior surface of the flexible substrate contacting said outer surface, the drum positioned for delivering the photosensitive element to the absorbent material, wherein at least one of the first and second frame portions are movable relative to the other;

first heating means for applying heat to the exterior surface of the composition layer on the drum adjacent where the absorbent material contacts the layer at the roller, the first heating means adapted to heat the exterior surface of the layer to a temperature T1 which is equal to or greater than a temperature T2 sufficient to cause a portion of the layer to liquefy, while maintaining the exterior surface of the flexible substrate at a temperature T3 at least 20°F. below temperature T1;

second heating means for heating the roller to a temperature capable of heating the exterior surface of the composition layer to a temperature T4 which is equal to or greater than temperature T2 while the absorbent material is contacting the exterior surface of the layer and while maintaining the exterior surface of the flexible substrate at the temperature T3 which is at least 20°F. below temperature T4;

pressure means for causing the photosensitive element and the absorbent material to come into contact between the drum and the roller at a pressure sufficient for at least a portion of the liquefied material of the composition layer to be absorbed by the absorbent material; and

separation means for separating the photosensitive element from the absorbent material.

2. (Original) The apparatus of Claim 1 further comprising a forced cooling means for cooling the photosensitive element.

3. (Original) The apparatus of Claim 2 wherein the cooling means comprises means for cooling the circumferential surface of the drum that contacts the flexible substrate.

4. (Original) The apparatus of Claim 2 wherein the forced cooling means is disposed at a location where the element is separated from the absorbent material.

5. (Original) The apparatus of Claim 1 wherein the first heating means comprises an infrared heating device.

6. (Original) The apparatus of Claim 5 further comprising:

a sensor for sensing the temperature of the infrared heating device; and

a controller for controlling power to the infrared heating device to maintain the sensed temperature at a preselected temperature.

7. (Original) A method for forming a relief pattern from a photosensitive element comprising a flexible substrate having an exterior surface and an interior surface, and a composition layer on the substrate capable of being partially liquefied, the composition layer having an exterior surface and an interior surface, with the composition layer and flexible substrate joined at their respective interior surfaces, comprising:

supporting the element with the exterior surface of the flexible substrate in contact with an outer circumferential surface of a drum mounted for rotation in a second frame portion;

contacting an absorbent material to the exterior surface of the composition layer by passing the material over an exterior surface of a roller mounted for rotation in a first frame portion, wherein at least one of the first and second frame portions are moveable relative to the other;

heating the exterior surface of the composition layer to a temperature T1 which is equal to or greater than a temperature T2 sufficient to cause a portion of the layer to liquefy, while maintaining the exterior surface of the flexible substrate at a temperature T3 at least 20°F. below temperature T1;

heating the absorbent material to a temperature capable of heating the exterior surface of the composition layer to a temperature T4 which is equal to or greater than temperature T2;

pressing the absorbent material against the composition layer by urging the first frame portion supporting the roller and the second frame portion supporting the drum toward each other at a pressure sufficient for the heated absorbent material to liquefy at least a portion of the exterior surface of the layer and to absorb the liquefied material;

maintaining the exterior surface of the flexible substrate at a temperature T3 at least 20°F. below temperature T4 during said pressing and heating of the absorbent layer; and

separating the photosensitive element from the absorbent material, thereby removing the absorbed liquefied material from the photosensitive element.

8. (Original) The method of Claim 7, further comprising maintaining the exterior surface of the layer at temperature T2 between the step of heating the surface to a temperature T1 and the pressing step.

9. (Original) The method of Claim 7, further comprising cooling the photosensitive element on the drum.

10. (Original) The method of Claim 9 wherein the cooling step is performed at a location where the element is separated from the absorbent material.

11. (Original) The method of Claim 9, wherein cooling comprises cooling the outer circumferential surface of the drum that contacts the exterior surface of the flexible substrate.

12. (Original) The method of Claim 7, wherein the contacting step further comprises mounting the roller in the first frame portion so that the roller is resiliently supported to freely align the roller surface with the exterior surface of the composition layer during the pressing step.

13. (Original) The method of Claim 7 wherein the composition layer comprises a photosensitive layer and an infrared-sensitive mask layer, wherein a surface of the infrared-sensitive mask layer opposite the photosensitive layer is the exterior surface of the composition layer, and a surface of the photosensitive layer opposite the infrared-sensitive layer is the interior surface of the composition layer.

14. (Currently Amended) A method for forming a relief pattern from a photosensitive element comprising a flexible substrate having an exterior surface and an interior surface, and a composition layer on the substrate capable of being partially liquefied, the composition layer having an exterior surface and an interior surface, with the composition layer and flexible substrate joined at their respective interior surfaces, comprising:

supplying an absorbent material to the exterior surface of the composition layer with a roller operating at a temperature Tr that heats the absorbent material;

delivering the photosensitive element to the absorbent material with a rotating drum~~, operating at a rotation speed, S,~~ and supporting the element with the exterior surface of the flexible substrate in contact with an outer circumferential surface of the drum, wherein each rotation of the drum defines a cycle;

heating the exterior surface of the composition layer sufficient to cause a portion of the layer to liquefy with a heater operating at a temperature Th;

pressing the photosensitive element and the heated absorbent material into contact between the drum operating at a rotation speed, S, and the roller at a pressure, P, sufficient for the heated absorbent material to liquefy at least a portion of the exterior surface of the composition layer and to absorb the liquefied material;

separating the photosensitive element from the absorbent material;

repeating the supplying, delivering, heating, pressing and separating steps for a predetermined number of cycles; and

changing at least one of the process parameters selected from the group consisting of temperature of the roller Tr, temperature of the heater Th, pressure P, and rotation speed S,

during at least one of the supplying, delivering, heating, and pressing steps for at least one of the predetermined number of cycles.

15. (Original) The method of Claim 14, further comprising forcefully cooling the photosensitive element after separating the element from the absorbent material, by a cooling means having a temperature Tc wherein the repeating step includes the cooling step and the changing step includes the temperature Tc of the cooling means as one of the process parameters in the group.

16. (Original) The method of Claim 14 wherein the composition layer comprises a photosensitive layer and an infrared-sensitive mask layer, wherein a surface of the infrared-sensitive layer opposite the photosensitive layer is the exterior surface of the composition layer, and a surface of the photosensitive layer opposite the infrared-sensitive layer is the interior surface of the composition layer.

17. (Original) In a method for producing a relief pattern comprising providing a photosensitive element comprising a flexible substrate having an exterior surface and an opposed surface having thereon a composition layer having an exterior surface, imagewise irradiating said layer to harden the composition in irradiated areas, contacting the exterior surface of said imagewise irradiated layer with an absorbent layer, heating said composition layer while in contact with said absorbent layer to a temperature sufficiently high to enable said composition in unirradiated areas to flow into said absorbent layer, and removing said absorbent layer and the composition from unirradiated areas from said photosensitive element, the improvement comprising:

maintaining the temperature of the exterior surface of the flexible substrate to a temperature at least 20°F. below the exterior surface temperature of the heated composition layer while in contact with said absorbent layer to control thermal distortion of the substrate.

18. (Original) The method of Claim 17, further comprising:

heating the composition layer to a temperature between 40°C. and 200°C. before contacting said absorbent layer; and

maintaining the exterior surface of the composition layer at said temperature until the absorbent layer is in contact with the composition layer.

19. (Currently Amended) ~~The~~ A method of forming a flexographic printing plate from a photosensitive element comprising a flexible substrate having an exterior surface and an interior surface, at least one composition layer capable of being partially liquified and comprising a photosensitive layer and an infrared-sensitive layer, the photosensitive layer having an interior surface opposite the infrared-sensitive layer, with the photosensitive layer and the flexible substrate joined at their respective interior surfaces, the method comprising:

(a) exposing the infrared-sensitive layer imagewise with infrared laser radiation to form in-situ a mask having actinic radiation opaque areas on the photosensitive

layer, the mask and the photosensitive layer not covered by the mask forming the exterior surface of the composition layer;

(b) exposing the photosensitive element of (a) with actinic radiation through the mask;

(c) treating the element of (b) with heat to form the relief pattern in the element, wherein the treating step is selected from a method I or II, wherein

method I comprises:

supporting the element with the exterior surface of the flexible substrate in contact with an outer circumferential surface of a drum mounted for rotation in a second frame portion;

contacting an absorbent material to the exterior surface of the composition layer by passing the material over an exterior surface of a roller mounted for rotation in a first frame portion, wherein at least one of the first and second frame portions are moveable relative to the other;

heating the exterior surface of the composition layer to a temperature T1 which is equal to or greater than a temperature T2 sufficient to cause a portion of the layer to liquefy, while maintaining the exterior surface of the flexible substrate at a temperature T3 at least 20°F. below temperature T1;

heating the absorbent material to a temperature capable of heating the exterior surface of the composition layer to a temperature T4 which is equal to or greater than temperature T2;

pressing the absorbent material against the composition layer by urging the first frame portion supporting the roller and the second frame portion supporting the drum toward each other at a pressure sufficient for the heated absorbent material to liquefy at least a portion of the exterior surface of the layer and to absorb the liquefied material;

maintaining the exterior surface of the flexible substrate at a temperature T3 at least 20°F. below temperature T4 during said pressing and heating of the absorbent layer; and

separating the photosensitive element from the absorbent material, thereby removing the absorbed liquefied material from the photosensitive element;

and, method II comprises:

supplying an absorbent material to the exterior surface of the composition layer with a roller operating at a temperature Tr that heats the absorbent material;

delivering the photosensitive element to the absorbent material with a rotating drum, operating at a rotation speed, S, and supporting the element with the exterior surface of the flexible substrate in contact with an outer circumferential surface of the drum, wherein each rotation of the drum defines a cycle;

heating the exterior surface of the composition layer sufficient to cause a portion of the layer to liquefy with a heater operating at a temperature Th;

pressing the photosensitive element and the heated absorbent material into contact between the drum and the roller at a pressure, P, sufficient for the heated absorbent material to liquefy at least a portion of the exterior surface of the composition layer and to absorb the liquefied material;

separating the photosensitive element from the absorbent material;

repeating the supplying, delivering, heating, pressing and separating steps for a predetermined number of cycles; and

changing at least one of the process parameters selected from the group consisting of temperature of the roller Tr, temperature of the heater Th, pressure P, and rotation speed S, during at least one of the supplying, delivering, heating, and pressing steps for at least one of the predetermined number of cycles.